Geophysical Research Abstracts
Vol. 21, EGU2019-1745-1, 2019
EGU General Assembly 2019

Understanding the atmospheric circulation response to tropical warming and polar stratospheric cooling

David W. J. Thompson and Ying Li
Department of Atmospheric Science, CSU, Fort Collins, CO USA

Numerical simulations forced with increasing greenhouse gases and stratospheric ozone depletion reveal a consistent poleward shift of the extratropical stormtracks. The shift is observed in the Southern Hemisphere during the ozone hole era, and is reproducible in simulations run in a hierarchy of numerical models and across a range of experiment designs. The shift has been traced to the circulation response to tropical warming and polar stratospheric cooling, but otherwise the dynamics of the shift remain open to debate. Here we provide evidence that the response of the extratropical jet and its associated eddy fluxes to climate change derive primarily from changes in the latitude of largest "stirring" of potential vorticity by baroclinic eddies. The mechanism is implicit in several previous studies, but to our knowledge, has not been explicitly tested and quantified in targeted transient numerical simulations. The results suggest that variations in the extratropical upper tropospheric isentropic slope play an essential role in governing the extratropical circulation response to a range of external forcings.